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(54) "METHOD FOR MANUFACTURING COMPOSITE SHEETS

(71) We, BRUYNZEEL FINEER-FABRIEK B.V., a Private Liability Company, of P. Ghijsenlaan, at Zaandam, Holland, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:–

The present invention relates to a method for manufacturing a laminate sheet, said sheets being covered with a layer of a polymer such as a rubber or rubber-like polymer, and to the products obtained according to said method.

In practice there is a great need of wood materials covered for special purposes with a layer of a polymer material, such as rubber or rubber-like polymer material, for application in floors, and roofing. The wooden substrate may e.g. be composed of three-ply, multi-ply or similar wood materials, such as fibre board or chip-board.

High requirements are made upon the rubber-wood connection. The rubber layer should be fixed to the wood very tightly, may not locally come off from which "bulging"-effects could result, whereas especially the connection along the edges should also be very strong.

It is known to fix rubber layers to a wooden or wood-like substrate by means of glue. However, in using the sheets covered with a rubber on rubber-like polymer layer for the above mentioned purposes, said connection is found insufficiently strong and/or the application of such a connection is expensive and in any production process it causes difficulties, because of the definitely different nature of the rubber-to-wood connection with respect to wood-to-wood connections. Moreover, in such cases only rubber sheets of specific dimensions can be used which are glued to a wooden substrate of equal dimensions.

For strengthening the rubber-to-wood connection there have been attempts to apply a rubber layer to, e.g. three-ply or multi-ply wood layers, by calendering and vulcanising. Several difficulties are involved in said process since the temperatures and pressures used therein are so high that the wooden substrate is found not resistant to such treatment. The humidity of the wood also interferes with the vulcanising process. During the treatment the connection between the layers of wood is liable to become loose.

The present invention provides a method for manufacturing the above mentioned products, wherein these disadvantages are removed.

According to the present invention there is provided a method of manufacturing a laminate sheet, wherein a wood veneer is covered on one side only with a layer of polymer which is bonded to the veneer by heating under pressure and the veneer is then bonded by glueing on its uncoated side to a wood substrate.

When rubber is used as the polymer, the heating under pressure, or vulcanising, has the effect of forming chemical bonds between the rubber and the veneer.

The wooden substrate can consist for example of one or more superimposed layers of wood, such as three-ply, multi-ply, fibre board or chip board, or of a number of wood layers not yet joined together which are joined to each other simultaneously with the application of the layer of veneer to the uppermost layer of wood substrate.

It is observed that from the British Patent Specification 787,776 it is known to apply by vulcanising a pre-formed sheet of a vulcanizable, natural or artificial rubber composition to a flexible layer composed of fibres, such as a layer of veneer or paper. Therein the layer consisting of fibres is impregnated with e.g. a melamine formaldehyde resin, whereas the rubber contains the same or a similar resin. The object is to obtain a flexible supple laminate the layer of veneer of which is used for covering a substrate such as room walls or table-tops, the rubber layer being used for fixation to the substrate.

In the following an embodiment of the

method of the invention is further explained. First of all the formation of a laminate in accordance with the invention will be described more in detail.

Forming the laminate in question means firstly making a bond between a layer of polymer material and a layer of wood veneer material. The polymer may contain a resin formed in the material by reacting a methylene donor with a methylene receptor. These layers of different material are brought into contact with each other and heated with applied pressure.

The wood veneer may be formed of wood *per se*, or wood powder or wood-shavings, glued together by means of a synthetic resin.

The polymer material maybe natural rubber or synthetic rubber or a mixture of these. Thus natural rubber, cis-polyisoprene, cis-polybutadiene, polychloroprene, nitrilic rubbers, polyisobutylene rubber and co-polymers such as butadiene with styrene and ethylene and propylene, the latter with or without a third monomer, can be used.

Examples of another group of usable polymers are thermoplastics such as polyvinyl chloride, polyvinyl acetate and vinylchloride co-polymers. If desired the layer of polymer material may also comprise a mixture of rubber and thermoplastics material.

Suitable methylene donors are the products which separate formaldehyde when heated, however are mostly stable until a given temperature e.g. 100°C. Suitable methylene donors are e.g. hexamethylene tetramine, lauryloxymethyl pyridinium chloride and polymers of formaldehyde comprising stabilised groups or residues of substances such as pentaerythritol at the ends of the molecule.

Substances suitable for serving as a methylene receptor are e.g. aromatic hydroxy compounds or phenol resins, capable or reacting with formaldehyde, such as Novolac resins. The aromatic hydroxy compounds may be a monohydroxy compound; however they are preferably dihydroxy compounds, wherein the hydroxy groups are preferably in the meta-position. Examples are resorcinol and 1,3-dihydroxy naphthalene.

The required amount of methylene receptor may vary between 1 and 10 per cent by weight, but preferably lies between 1 and 4 parts by weight for 100 parts of polymer. The polymer material also comprises a silica or silicate in an amount of up to 50 parts, preferably 10 to 25 parts in 100 parts by weight of polymer.

The method for forming a laminate according to the invention generally begins with the application of a polymer compound to a veneer whereafter said combination is pressure heated. Preferably the layer of polymer material is applied to the wood veneer by means of a calender and the pressure and temperature may be obtained by means of a press, e.g. a conveyor belt press. If the polymer consists of a material such as e.g. PVC, requiring a relatively low pressure, a so-called "Rotocure" (Trade Mark) machine may be used. Where the polymer layer consists of rubber, the latter is allowed to vulcanise during the heating. Simultaneously with the formation of the polymer-covered veneer by pressure and increase of temperature any desired profile can be impressed in the surface of the polymer layer.

As a rule the temperatures at which the veneer is covered with the polymer will amount from 140 to 170°C, preferably to about 155°C. The applied pressures mostly lie between 4 and 40 kgf/cm^2 for 15 to 30 minutes, the lower pressures being applicable in polymers such as PVC and the higher pressure relating to the rubbers.

The invention is explained below with reference to the following example:

To a rubber mixture comprising 70 parts by weight of natural rubber and 30 parts by weight of styrene-butadiene rubber of the normal mixture- and vulcanisation ingredients are added and also a methylene donor-receptor system, the latter comprising 1.2 parts by weight of hexamethylene-tetramine and 3 parts by weight of resorcinol in 100 parts by weight of polymer. The so obtained composition is bonded to a layer of wood veneer at a temperature of about 135°C., and a pressure of 30 kgf/cm^2 and during a pressing period of 10 minutes. The bond between the rubber layer of 3 mm thickness and the layer of veneer, e.g. gaboon, mahogany-, or sapele-veneer, of 2.6 mm thickness amounts to + 4 kg/cm.

The method described above for forming a laminate is considerably simpler than that wherein the laminate is formed by fixing to wood an already vulcanised sheet of rubber by means of glueing. In addition the method of the invention provides a much higher level of attachment and better reproduceable bonding values.

Using a so-called "open"-peeled layer for the layer of veneer is found recommendable, said "open"-peeled layer being capable of being fed through a calendering- and vulcanising device, starting from the wound-up condition of the layer. The "open"-peeling of the layer of veneer has the advantage that during the vulcanising process the rubber is allowed to properly penetrate into the layer of veneer resulting in an exceptionally strong bond. In this case said "open"-peeling is possible since in the final product the rubber layer is used as outer surface, the layer of veneer being fixed to a wood substrate. In contrast with e.g. three-ply and multi-ply one single layer of veneer is found very resistant to working conditions like temperature and pressure such as applicable in vulcanising rubber to a layer of veneer. The humidity of the layer of veneer is found no impediment in vulcanising a layer of rubber to it, although some sort of drying, e.g. up to a

humidity of 8-10% by weight, seems recommendable for obtaining a maximum bonding whereas in vulcanising a layer of rubber to e.g. textile tissues the latter have to be thoroughly dried before.

An additional important advantage of said method is that continuous manufacturing is possible since the layer of veneer can be fed by the calendering- and vulcanising device from a roll. As a matter of fact this is not essential as smaller unwound sheets of veneer can also be used.

The laminate manufactured in the way described before forms a semi-manufactured product consisting of a layer of rubber and a layer of veneer firmly bonded to it, said product being very flexible and capable of being kept and stored in rolls, whereas the bond between the layers of rubber and veneer apart from being very strong will not locally loosen such as e.g. at the edges and it neither will show any signs of bulging in the long run. The so obtained semi-manufactured article can be applied to a wooden substrate then e.g. to three-ply, multi-ply or to other similar wood materials. In doing so only a wood-to-wood joint is applied which can be obtained in the usual way, e.g. by pressing. This wood-to-wood joint can also be used in a continuous process or within certain limits to sheets or arbitary dimensions.

It is equally possible, starting from the semi-manufactured product, viz. the rubber-veneer laminate, to apply the latter to a substrate consisting of a number of layers of wood still not bonded to each other. Then in one single operation the layers of rubber and veneer can be fixed to the substrate whereas simultaneously various layers of said substrate can be joined together.

The product obtained in applying the above mentioned method therefore consists of a combined rubber-veneer layer and a wooden substrate, e.g. formed from three-ply, multi-ply fibre- or chip-board or suchlike materials usually constructed from one or more layers. Furthermore with a view to the equilibrium of the sheet a thin layer of foil may be applied to the product's bottom side, also in applying of traditional wood-joining techniques. As a matter of fact the product in question can be cut to smaller or larger sheets or strips capable of being juxtaposed to form e.g. a floor to which requirements of resiliency and wear resistance must be made or a weatherproof roofing.

WHAT WE CLAIM IS:—

1. A method of manufacturing a sheet, wherein a wood veneer is covered side only with a layer of a polymer bonded to the veneer by heating under and the veneer is then bonded by glue uncoated side to a wood substrate.

2. A method according to claim 1 the veneer is covered with the polymer temperature of between 140-170°C at a of 4-40 kgf/cm² for 15-30 minutes.

3. A method according to any one claims 1 or 2, wherein the polymer comprises natural rubber, synthetic rubber or a mixture thereof.

4. A method according to any one of claims 1 to 3, wherein the polymer comprises a thermoplastics material or a mixture of natural or synthetic rubber and a thermoplastic material.

5. A method according to any one of claims 1 to 4, wherein to a mixture of 70 parts by weight of natural rubber and 30 parts by weight of styrene/butadiene rubber of vulcanisation ingredients, are added and also a methylene-donor-receptor system whereafter the so obtained composition is bonded to a layer of wood veneer by pressing at a temperature of about 135°C and a pressure of 30 kgf/cm² for 10 minutes.

6. A method according to any one of claims 1 to 5, wherein the substrate comprises a number of mutually connected layers of wood.

7. A method according to any one of claims 1 to 5, wherein the substrate comprises a number of layer of wood still not connected to each other which are mutually connected with the application of the layer of veneer to the uppermost layer of wood.

8. A laminate sheet composed of one or more layers of wood having bonded thereto a wood veneer covered on one side only with a layer of polymer, obtained by carrying out the carrying out the method of any one of claims 1 to 7.

9. A method as claimed in claim 1, substantially as hereinbefore described.

10. A method for manufacturing a laminate sheet, substantially as described in the example.

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